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June 13, 1988

Mr. Gerardo Armador
Environmental Protection Agency
Region III
841 Chestnut Building
Philadelphia, Pennsylvania 19107

Re: Letter Report on Hydrogeological Report
TES III Contract No. 68-01-7351
Project No. 05-B87700
Work Assignment No C03001
Du Pont Newport Site, Region III

Dear Gerardo:

Please find enclosed Jacobs review and comment on the revised Hydrogeological Report.

This review also includes Appendices A thru E of Volume 2 of the Hydrogeological Report.

Please feel free to contact me if this format does not meet your requirements.

Sincerely yours,

JACOBS ENGINEERING GROUP INC.

Paul J. Fikac

Paul J. Fikac
Region VI
Work Assignment Manager

PF/mjo

Enclosures

cc: M. Warner
J. McKnight
P. Fikac
File

DRAFT

REVIEW/COMMENTS ON DU PONT NEWPORT SITE

I. GENERAL

1.0 Introduction

This report is prepared in accordance with EPA directions as received by Jacobs Engineering Group Inc. (Jacobs) in Work Assignment C03001, RI/FS Oversight.

The purpose of this report is to present the results of Jacobs Review on the Work Plan for the Remedial Investigation/Feasibility Study (RI/FS), Du Pont Newport Site. The Work Plan was reviewed per the guidelines of the "U.S. EPA Guidance on Remedial Investigations Under CERCLA, July 1985" and "U.S. EPA Guidance on Feasibility Studies Under CERCLA, July 1985". It also addresses the objectives of the Remedial Investigation (RI) and Feasibility Study (FS) as contained in the Consent Order.

Included in this report is the Review of the Quality Assurance Project Plan (QAPP). Health and Safety Plan (HASP) and Appendices F through J. The detailed review and comments on Appendices A through E will be provided in a separate report on the Hydrogeological Report. No comments will be made on Appendices K and L.

No Separate Sampling Plan was submitted. However,sections 6.0 and 7.0 of the QAPP address all the necessary sampling requirements. Table 2-1 of the RI/FS Work Plan, and Table 3-2 of the QAPP identify the planned sampling and analysis effort.

Grammar, spelling and reference errors, if found during the review, are noted as a matter of courtesy

2.0 Site History

The Du Pont Newport site, originally, was tidal wetlands before it was used as a burning dump and industrial landfill from 1902 until 1975.

The Du Pont Newport Site consists of two separate area's separated by the Christina River. The northern portion is a seven acre parcel bounded on the south by the Christina River and on the north by the Du Pont Holly Run Plant and Ciba-Geigy Newport Plant. The southern portion is a fifteen acre parcel bounded by the Christina River on the northwest. These parcels are referred to as the North Disposal Site and the South Disposal Site respectively.

The Newport Plant is a pigment manufacturing plant located at James and Water Street in Newport, Delaware. The plant was originally owned and operated (from 1902 to 1929) by Henrik J. Krebs for the manufacture of Lithopone, a white inorganic pigment. In 1929, Du Pont purchased the plant and continued to manufacture Lithopone along with other materials, including organic and inorganic pigments The pigment manufacturing operations were purchased by Ciba-Geigy in 1984. Du Pont has retained the chromium dioxide magnetic recording tape operations at their Holly Run Plant.

During past plant operations, areas of the Site bordering the Christina River were landfilled as a means of waste disposal. Landfilling occurred in both the North Disposal site and the South Disposal site. The North Disposal site was used for disposal of general refuse and process wastes from 1902 until 1974. The North Disposal site received a variety of material, including plant debris such as off-spec product Corian (imitation marble) counters, empty steel drums, metal alloys, liquid wastes, and pigment muds. After disposal ceased in 1974, the North Site was capped with approximately two feet of clay.

The South Disposal site was operated from approximately 1902 to 1953. Materials deposited in this landfill consisted of primarily insoluble residues of zinc and barites ores, which were pumped as a slurry through a pipeline under the Christina River. Some dikes and berms were constructed to contain the material. In 1973, the State of Delaware, Department of Highways, deposited approximately 130,000 cubic yards of additional soil from highway construction at this location, covering the South Disposal site with an average three feet of variable soil.

During the period 1975 to 1981, ground water quality investigations were conducted by Du Pont under the approval of the State of Delaware, Division of Natural Resources and Environmental Control (DNREC). Over this time, additional test wells and monitor wells were installed to evaluate the geologic and hydrogeologic conditions in the vicinity of the Newport Site. Some of these monitor wells are still utilized to monitor groundwater quality and water levels. The North Disposal site was the subject of a Hazardous Ranking System (HRS) evaluation made by the EPA in 1986. Consequently, Du Pont directed Woodward Clyde Consultants to conduct a series of investigative tasks during June, July, and August of 1987. These tasks were addressed in th Proposed RI/FS Work Plan submitted by Du Pont to the EPA in July, 1987. The South Disposal Site was included in the RI assessment because certain waste products were also disposed at that site.

The RI assessment, was designated as Phase I and was designed to collect data to determine the need for a complete RI/FS.

The current status on the Newport Site is that the Phase I field tasks proposed in the July 1987 Work Plan were completed and that additional RI tasks, along with the Endangerment Assessment and the Feasibility Study, will be conducted in accordance with this April 1988 RI/FS Work Plan.

II. , GENERAL COMMENTS BY SECTION

A. Work Plan

1. Part II Remedial Investigation (RI)

In review of the Work Plan, in correlation with th RI objective , it is apparent that all except the first objectives are met. The first objective states a full determination on the extent of groundwater contamination as related to the site. The earlier Phase I investigation provided some answers; however, there are remaining areas onsite and offsite that are not covered by the Phase II RI of this Work Plan and will be identified in this report.

a. TASK I - DESCRIPTION OF CURRENT SITUATION

1) SITE BACKGROUND

This part of the work plan provides an adequate description of the site and past activities. The succeeding paragraphs will address only those areas that have comments.

The regional location map has no apparent benefit to the narrative and should be replaced by a map that shows the Christina River, Delaware River and Delaware Bay Area relationship. The detailed topography map and plans of the site area should only be reduced to a scale that is readable. The direction of river flow should be indicated to maintain the down river perspective.

The initial and previous remedial investigations provide substantial support of the noted site geology and hydrogeology. However, several data gaps have been identified.

The hydrostratigraphic units identified should be supported by soils laboratory test data. The test borings conducted during Phase I should have included selected soil tests to support the lithology in the boring logs and the appropriate standard Unified Soils Classification Symbols utilized. The perimeter monitor well installation discussion did not indicate if a coring log was prepared during drilling. If so, these logs should be included to support the Unit I stratigraphy.

The cluster well installation during Phase I did not consider the screening of wells at the interface between Unit I and Unit II. The organic contaminants identified at the site have a specific gravity that is greater than 1.0. Consequently, they should be expected to sink to the lowest point in the aquifer. Given the present design specification, this zone would not be adequately monitored.

Ask my hydro. – *

The Borehole Geophysical Logs provide supportive information to the physical test boring lithology. The results of the Geophysical logs addressed in this section are based on the interpretations of the well log analyst.

In comparing the Geophysical logs with the Test logs, there appears to be a discrepancy in the location of the Unit I and Unit II boundary as shown in figure 1-10. There are indications that Unit II is present at the surface at TB-1, and that Unit I does not go below the bottom of the Christina River. This can be seen by careful analysis of boring logs and geophysical information on TB-1, 2 and 4. A detailed discussion on the Geophysical logs is covered in a separate Letter Report on the Hydrogeological Report Review.

Discussion on the Surface Geophysical Survey does not address the effects of high organic and metal contamination, soil moisture and different geological zones on the resistivity reading. Also, an explanation on electrode spacing to depth correlation would be most helpful. The Geophysical Survey is covered in a detailed review of Appendix F.

The objective of the Soil Gas Survey was to delineate trichloroethylene (TEC) and tetrachlorothylene (PCE) vapor concentrations. No mention is made about the reaction of vapors in water from a compound with a specific gravity greater than water. In addition, current documents on biotransformation infer a relationship between the concentration fo PCE's and TCE's over a period of time. A more detailed discussion of the Soil Gas Survey is covered in the review of Appendix G.

The use of a Ground Radiometric Survey to locate thorium wastes buried greater than two (2) feet below the surface is of limited use because of the mass attenuation of radiation by the overlying soils. This applies according to uranium 238. However, a radiometric survey will locate any surficial radioactive contaminant and near surface hot spots. A detailed discussion of this subject is offered as a review of appendix H. The presence of Radium -228 and gross alpha concentration found in an analysis of ground water in well SM-4 indicates that ground water is in direct contact with the thorium wastes. In pure speculation, the thorium waste must have been dumped directly into the landfill or the 55 gallon drums containing the thorium waste have rusted away and water has made contact with the thorium in the jars.

The presence of thorium wastes would not be identified by a radon gas survey. In addition, the presence of radon gas is not necessarily indicative of the presence of uranium. A discussion on radon gas sampling is included as part of the detailed appendix I review.

2) NATURE AND EXTENT OF PROBLEM

The North Disposal Site waste characterization does not identify any maintenance wastes. The description of past maintenance activities and waste disposal should be included in this section.

The Existing Data Evaluation, section 1.2.2 should be combined with section 1.1.6, Previous Remedial Investigations.

This will reduce duplicity and provide for a more complete discussion of the topic. Most of the subtopics are already detailed in a separate appendix.

The evaluation of hydrogeology data in this work plan states that the Columbia formation is partially recharged from the underlying Potomac formation. For this to happen, there must be penetration of the Unit II aquitard. This implies a pathway from Unit I to Unit III A. SM-3 and MW-3A are shallow (Unit I) wells located north of the river and the Unit III A wells, MW-4B and DMU-7 are located south of the river. All show the presence of PCE and TCE. Also, the 1980 monitor well analysis in Appendix G indicates the presence of two Unit III A wells; DM-3, north of the river and DM-5, south of the river, as having high levels of PCE and TCE concentrations. Current ground water samples do not address the presence of these two wells. DM-3 was discussed in early 1980 analysis as not being installed properly. Because the S.G is greater than 1.3, the PCE's and TCE's found in the ground water north of the river would continue to sink to the lowest level in Unit III A and possibly even lower by infiltration of Unit III B. However, biotransformation would change tetrachloroethylene to trichloroethylene and 1,2-Trans-Dichloroethylene as it continued down the pathway. Therefore, it implies that a pathway exists from the surface north of the river to ground water in Unite III A south of the river. Detailed comments are covered in a separate review on the hydrogeological report.

The same toxic metals and organic compounds found in the North and South landfills and in several monitor well samples can also be found in the Christina River water. This implies that there is a direct release of these substances into the river water. However, the river sediment levels are lower than those of the water. This indicates that some type of leaching or flushing action is causing the release.

The section 1.2.3, on POTENTIALLY AFFECTED MEDIA, should be changed to indicated AFFECTED MEDIA. The preceding sections of the work plan and the attached appendices have factually indicated that these media have already been contaminated.

b. TASK 2 - SITE INVESTIGATION

In review of the waste characterization, several areas remain questionable. The radium -228 contaminated ground water in SM-4 has not been traced to its source. The extent of leachate migration from the disposal sites has not been identified. The review of monitor well locations in Figure 1-7 indicates that gaps remain unmonitored and there is:

1) A distance of ~1000 feet between DM-4 and MW-14.

2) A distance of ~1200 feet between DM-4 and the MW-7 cluster.

3) A distance of ~1100 feet from the MW-4 cluster and the northeast edge of the South Disposal Site.

4) A distance of 600 feet between SM-3 and SM-1.

5) No MW in Unit III A between DM-3 and east edge of North storage area.

6) A distance of 600 feet from MW-1 cluster to center of the North Disposal Site.

7) No offsite Monitor Well east of the South Disposal Site.

The concentration and extent of contamination that is entering the river from the Disposal Sites must be measured. In addition, monitor wells MW-14 and MW-15 show high levels of metals in the ground water. The quality of ground water must be adequately established south and east of the South Disposal Site. Also, does contamination continue to enter the ground water in the vicinity of the plugged DM-3 and DM-5 wells?

Ground water samples should be taken again from MW-4B, SM-3 and DMU-7 to see if the PCE levels in the ground water has changed. Monitor Well SM-4 should be sampled again to verify that Radium -226 is still present in the ground water.

During the aquatic tests onsite, sediment samples should also be taken from the drainage ditches to ascertain if there is contaminant runoff from the clay cap.

c. TASK 3 - SITE INVESTIGATION ANALYSIS

The objectives of this task will meet the requirements of the Endangerment Assessment and Feasibility Study.

d. TASK 4 - REMEDIAL INVESTIGATION (RI) REPORT

There are no comments on this task.

3) FEASIBILITY STUDIES

The tasks identified in this part of the Work Plan are in accordance with the U.S. EPA Guidance on Feasibility Studies Under CERCLA, 1985.

The Data Management section provides necessary guidance for data tracking, processing, storage and retrieval of analytical documents.

B. Quality Assurance Project Plan (QAPP)

The QAPP adequately covers the requirements of this work plan. However, a separate sampling plan, that could also be for field use, would be more appropriate. The words like suggest, recommend, and should, are not appropriate in a QA manual.

C. Health and Safety Plan (HASP)

The HASP is adequate for use with this work plan. Detailed comments are discussed in a later portion of the report. The HASP should not be used for a sounding board that is based on opinions.

The HASP is very specific as to the qualification of the designated SSO. The HASP does not identify Mr. James Buczala's qualifications to be the SSO.

III SPECIFIC COMMENTS BY SECTION

1.0 Work Plan

Page 1, para. 4, Table I-1

On third line, Table I-1 cannot be found.

Page 3, 1.1.1, para. 2

Insert a "," beyond the Holly Run and Newport plants,"

Page 5, para. 2

Should read "Figure 1-3", not "Figure 1-2".

Page 5, para. 3

Line 3, refers to (see Section 1.1.6.12) - this section does not exist .

Page 5, para. 3

Line 4 should read Figure 1-3, Figure 1-2 does not show topographic details.

Page 5, 1.1.4.1

Line 2 refers to (Figure 1-4) - This figure does not cover the Delaware Bay Area as discussed and should be replaced with an appropriate map.

Page 8, 1.1.4.3, para. 1

In last line, "prescribed" should be "described".

Page 8, 1.1.4.3, para. 3

In line 2, delete - except where saline water is encountered.

Page 9, para. 1

In line 7, add "," after River and after Newport.

Page 10, para. 1

In line 4, delete the word "lower".

In line 8, add the word "top" in front of part referring to Unit III A and add "bottom" in front of part referring to Unit IV.

In line 11 add the word "middle" behind silty.

Page 14, para. 1

In line 5, reference "(see Section 1.1.6.2)" is not in downhole geophysics.

Page 16, para. 3

The shallow well screens, as installed on the Cluster Monitoring Wells from above the observed water table depth to at least several feet into the shallowest sand or gravel interval, will not identify or capture any sinking compounds.

Page 26, 1.1.6.2, para. 4

In line 4 should read "Table 1-5".

Page 28, para. 1

In line 1, move phrase "immediately after sampling" from end of sentence to front of sentence, behind the word "field".

Page 28, para. 3

In line 3 should read "(see 1.1.6.10)".

Page 32, para. 1

Indicates the jars containing thorium wastes were placed in 55 gallon barrels together with disposable protective clothing and debris. Additional information is needed on the type of barrels and materials of construction, what kind of lids did the jars have and were the jars and other wastes encased in concrete inside the barrels?

Page 32, para. 6

Conducting a radiometric survey for locating gamma radiation from the buried thorium waste is not effective. This subject is covered in the General Comments and in detail as part of the review on Appendix H.

Page 33, 1.1.6.6,

A detailed discussion of this section is covered in the review of Appendix I. It should be noted that uranium is not identified in any processes at the Newport Plant; however, uranium is often found in the presence of barium and zinc ores. Low levels of sulfuric acid could include uranium ions in the solution and this can only be found by taking water and soil samples

Page 34, 1.1.6.7, para. 1

End of paragraph should read section 1.2.28.

Page 39, para. 3

In line 6 - correct to read Table 1-6.

Page 44, 1.2.1.1, para. 1

Statement "No known disposal of RCRA-listed hazardous waste has occurred at the North Disposal Site" is questionable. Page 3, paragraph 45 indicates that the Quinacridone process also used tetrchloroethylene and that some quinacridone wastes may have been contaminated with tetrachloroethylene. Tetrachloroethylene is a RCRA listed F-Solvent. Also, no mention is made of maintenance activities at site. What compounds were used for degreasing or as solvents during clean-up activities as part of the maintenance or metal production. What volumes were used and where did runoff or liquid wastes go?

In line 7, what are Dowtherm Constituents?

Page 48, para. 3

In line 5, Table 1-10 can not be found in Work Plan.

Page 49, 1.2.2.1

Detailed comments on the hydrogeology is covered in the review of Appendix B.

Page 50, para 3

In line 4 should read "Appendix B".

Page 51, para. 2

Line 3 should read "Appendix B".

Page 51, para. 4, last sentence

See General Comments section on disputing this statement.

Page 54, 1.2.2.4,

The TCE and PCE concentrations normally appear at the same place. Recent Biotransformation studies of chemical compounds show Trichloroethylene (TEC) to be a product in a Biotransformation reaction of Tetrochloroethylene (PCE). Therefore, TCE should almost always appear in conjunction with PCE.(See References).

Page 57, 1.2.2.4

Conclusions: Several explanations are given for the presence of methylene chloride. However, no mention was made of the possible presence of methylene chloride in the laboratory wastes that were disposed. Benzene and trifluorochloromethane were also found in the vadose zone. Benzene is a compound that is used as a solvent and is also found in many fuels. Trifluorochloromethane (Freon) is a refrigerant or aerosol propellent. No mention is made of these as being possible maintenance residue wastes.

Page 58, 1.2.2.5

The detailed comments on the Ground Radiometric Data is covered in the review of Appendix H.

Page 59, 1.2.2.5

There is agreement with the conclusion that further ground radiometry is not warranted; however, the fact remains that Radium -228 and gross alpha concentrations were found in a sample from Monitoring Well SM-4 and further investigation as to the source is warranted.

Page 59, 1.2.2.6

The detailed comments on the Radon Gas Data is covered in the review of Appendix I.

Page 60, para. 2

Conclusions do not state further action to be taken. In reference to subparagraph 4, the potential health risk to field personnel is practically non-existent and any type of venting due to drilling will cause immediate release and dispersion into the atmosphere.

Page 67, 1.4

Current information given does not determine the location of the waste limit, therefore the conceptual boundary drawn at fifty feet distance of the waste limits is questionable. A more feasible boundary would be to use some relationship to the property line.

Page 67, 1.5

The site map indicated is illegible for its size. Reproduction size should be limited to legibility not requiring a magnifying glass.

Table 1-2

Wells DM-3 and DM-5 have a current status as plugged. No information has been provided on what "plugged" means. It should be determined if the casing was removed and the hole grouted or was the casing only plugged? If the latter occurred, then it is possible that contamination can reach the lower aquifer by migrating around the outside of the casing.

Table 1-8

The waste disposal inventory does not identify any type of maintenance wastes. What was disposal system for maintenance wastes. Also, off grade would be a better word than bad quality.

Figure 1-2

Show a direction of flow arrow for the Christina River.

Figure 1-4

Use drawing that shows Delaware Bay.

Figure 1-7

Does not show location of Monitor Wells DM-3 and DM-5 which are addressed in the work plan.

Page 68, 2.1, para. 3

In line 5, Table 1-10 indicated is not in Work Plan.

Page 70, 2.5

The evaluation of these photographs will show a detailed chronology of visual changes to the sites over the period of time and hopefully will assist in preparing a history of waste disposal.

Page 70, 2.6

Upper aquifer monitor wells should be installed around the entire perimeters of the South Disposal area at a spacing of approximately 200 feet. In addition, monitor wells should be located downgradient from the site at distance(s) that would identify the downgradient limits of the plume.

Additional samples should be taken from Monitor Wells SM-3, DM-4, DMU-7 and MW-4B which currently identify PCE's in Unit III A.

Page 72, 2.7

Taking samples at the mouth of the Christina River seems to be a little far fetched. Why not at a point where the river widens beyond the James Street Bridge?

APPENDIX F - SURFACE GEOPHYSICS SURVEY

A review was made of the Draft Surface Geophysic Survey, Du Pont Newport Site, Newport, Delaware relative to the use resistivity soundings to better define the boundary of fill material deposited within these two sites.

COMMENTS AND OBSERVATIONS

In correlating the resistivity values contoured on figures 2 through 9, a fairly representative estimate can be made of the waste present in the two landfills. The overall upper level contours 0-15 feet find the resistivity reacting to increasing wastes in the landfill. In reviewing the contours found at depths of 45-60 feet, it interestingly correlates with PCE/TCE and metal contamination identified to be present at this level. Specifically, contamination that was noted in the old DM-3, DM-4, and DM-5 wells.

However, the landfill boundaries were not identified because the survey did not cover the entire landfill area.

The following items should also be included in this report:

oHow were the resistivity values correlated with the depth-show the method and a sample calculation?

oDiscuss further the apparent resistances of soils not affected by waste versus data obtained for organic or inorganic wastes.

oExplain the effects of geologic units, brine and the presence and/or absence of moisture or reversals in water movements.

oEach diagram should have an explanation which lists the following:

1) North arrow
2) Contour Units
3) Explanation of data to possible waste or contamination location.
4) Known physical boundaries of the plot.
5) Computer printed contours should be legible.

CONCLUSIONS AND RECOMMENDATIONS

The resistivity sounding and terrain conductivity surveys are a very useful tool in determining the location of waste masses. Further interpretive discussions of the plots would provide the reviewing personnel with the intent of the survey and a better understanding of data.

APPENDIX G - SOIL GAS SURVEY

A review has been made of the "Draft Soil Gas Survey, Du Pont Newport Site, Newport, Delaware. The evaluation addressed the objective to delineate trichloroethylene (TCE) and tetrachloroethylene (PCE) vapor concentrations in the North and South Disposal Sites.

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COMMENTS AND OBSERVATIONS

The use of a soil gas survey provides a quick and effective method for scoping the limits of most organic contaminant migrations. In particular, those compounds which volatile in the vadose zone.

Normally, the most abundant or most migrative compound is used as the indicator compound for the survey. The selection of PCE and TCE as the indicator elements meet the above criteria. However, specific detailed information should be reviewed about the indicator compound.

Current studies indicate that PCE undergoes a natural biotransformation to TCE. Basically, biotransformations are the steps that a compound goes through in a natural biodegradation process.

In reviewing the analysis on the Pre-existing well (1980), PCE and TCE have been found in the shallow and deep wells around the perimeter of the North Disposal Site. However, PCE and TCE have been found only in the intermediate wells (Unit III A) DM-4, DM-5, and DML-7 at the South Disposal Site.

In reviewing the 1987 analysis on the pre-existing and new wells, PCE and TCE were found in varying concentrations in wells MW-1A, MW-1B, MW-2A, MW-2B, MW-2C, MW-3A, SM-2, SM-3, SM-5, and DM-8 at the North Disposal Site, and wells MW-4B, MW-8, DM-4, DMU-7 at the South Disposal Site. The wells noted in the North Disposal Site include both Unit I and Unit III A and one Unit IV weil MW-2C. The wells noted in the South Disposal Site are Unit III A wells.

The results of the soil gas survey Figure 3 thru 5 indicate the presence of PCE and TCE in the surficial soils of the North Disposal Site. However, neither of these compounds were detected in the South Disposal Site.

The results of the soil gas survey parallel the shallow groundwater analysis.

CONCLUSIONS AND RECOMMENDATIONS

The soil gas survey provides a quick method for identifying the limits of PCE and TCE contamination in the shallow soils as noted in the correlation at the North Disposal Site.

The absence of shallow soil PCE and TCE contaminants on the South Disposal Site plot indicates that the PCE's and TCE's found in the Unit III A wells MW-4B, MW-8, DM-4 and DMU-7 did not come from the South Disposal Site

Consequently, it must be assumed that the wells at the North Disposal Site have some migratory pathway to the Unit III A wells at the South Disposal Site.

In particular, monitor wells MW-1A, MW-2A, MW-2C and SM-5 have concentrations greater than 300 ppb and are all located upgradient of both Disposal sites. With PCE identified in MW-2C, it can be established that the PCE's have broken through the Unit II acquitard and have contaminated the Unit III A and IV aquifers. Since PCE has a specific gravity of 1.6, it is called a sinker and a downgradient migration is expected.

APPENDIX H - GROUND RADIOMETRIC SURVEY

A review was made by Douglas Gonzales, PhD. Jacobs, of "Draft Report on Ground Radiometric Survey of Du Pont Newport Site, Newport, Delaware". Pertinent evaluation criteria addressed the stated objective of verifying that buried thorium dioxide wastes did not contribute to elevated surface exposures, radiological health considerations of the observed gamma radiation field across the existing disposal site and the relevance of conducting additional radiometeric surveys.

oSurface gamma-ray surveys are of limited utility in the assessment of the distribution and concentration of gamma-emitting radionuclides dispersed in soil at depths greater than *one to two feet below the ground surface due to mass attenuation of the original emitted radiation flux by the overlying soil. For example, for uranium mill tailings buried under soil covers it has been demonstrated that each foot of soil gives rise to an order of magnitude reduction in gamma exposure.

oAlthough the Th -232 natural decay series contains elements that emit more energetic gamma-rays than the U -238 chain (maximum energy of 2.6 Mev for Tl -208 in the Th -232 chain compared to 1.76 for Bi -214 in the U -238 series), the possibility of observing a significantly elevated surface gamma exposure due to moderate concentrations of Th -232 source material under 10 feet of soil is virtually nil.

oIn light of the above observations, the radiometric gamma survey performed appears adequate to assess average surface exposures and eliminate the possibility of specially extended, near-surface "hot spots": assuming that the remaining, uncharacterized on-site area to the east has similar radiological properties.

- It is reasonable to conclude, that the average gamma-exposure-rates on the site are not significantly different from background levels in the vicinity and that any observed, minor deviations from background are not directly associated with previously buried thorium dioxide wastes. Accordingly, additional on-site surface gamma surveys are not recommended.

- However, since the surface area of the disposal site was not capped until 1974, the possibility of off-site dispersion of contaminants by wind and surface water erosion cannot be ruled-out. Additional radiological surveys of the off-site environment should be considered in the prevailing wind directions and in areas receiving sediments transported by surface water discharge.

- An assessment of the potential off-site radiological contamination could be based on a limited analysis of archived samples of waste material from the first foot below the cap to assess radionuclide concentrations: the known presence of process residuals from ores containing zinc and barium implies the possibility of associated trace quantities of uranium and thorium series elements, as well. The off-site concentrations of radionuclides from these sources due to erosion, if actually present in the waste material, are likely to be low.

CONCLUSION AND RECOMMENDATIONS

Since available data indicates essentially background gamma exposures across the site, elevated health risks to on-site workers and nearby, off-site residents is not expected from this pathway.

APPENDIX I - RADON GAS SAMPLING

A review was made by Douglas Gonzales, PhD, Jacobs of the "Draft Report Radon Gas Sampling Du Pont - Newport Site, Newport, Delaware relative to the utility of radon -222 as a measure of subsurface uranium -238 concentrations, leaching of U - 238 and Ra -226 from the landfill into the groundwater and any associated radiological health consequences derived from borehole or test pit venting of radon during future subcap exploration activities.

COMMENTS AND OBSERVATIONS

- As noted in the attached article, the concentration of radon in soil gas for rather ordinary soils ranges from 100 - 1000 pCi/l of soil air. Accordingly, the measured values of 21 -330 pCi/l obtained from the limited sampling program on the Du Pont site do not imply that elevated concentrations of Ra -226 are present (typical soil concentrations are about 0.5 - 1.5 pCi/g Ra -226). Furthermore the presence of radon gas does not necessarily indicate that uranium also is present in secular equilibrium . For example, uranium mill tailings are low in uranium due to the extraction process, although nearly all of the Ra -226 which originally was in near secular equilibrium with the uranium parent remains with the mill tailings.

- The EPA outdoor radon measurements are not detailed as to detectors used, monitoring locations and duration of the monitoring program. Consequently, insufficient information is available to judge the overall adequacy of this radon monitoring program. Assuming that detected 0.2 pCi/l outdoor radon concentration is representative of levels on the site, it appears that any radionuclides contained in the site are not influencing the ambient air quality: the 0.2 pCi/l value is probably a typical background radon concentration for the area

- It is not unreasonable to have soil gas radon levels in the landfill two to three orders of magnitude greater than the outdoor air concentrations. As noted above, such conditions prevail even for rather ordinary soil conditions. If the soil gas radon was vented to the atmosphere by removing a portion or all of the clay cover , atmospheric dilution and dispersion of the radon gas, radon would occur.

  Assuming that the soil gas radon measured in the limited sampling program are typical of the entire site, it is doubtful that a significant increase in the observed outdoor radon concentrations would result.

- As correctly noted in the report, the material properties of the clay cap produce an elevated moisture saturation and a reduction in the porosity and radon diffusion coefficient relative to the underlying material. As a result, the radon is inhibited from diffusing into the atmosphere and decays in the landfill material and overlying cap. Therefore, the measured soil gas levels with a cap installed would exhibit higher concentrations then that without a cap.

- The conclusion that U -238 and Ra -226 are being released into the groundwater based on a limited number of soil gas radon measurements is without foundation. The site history and waste characteristic summary indicate that the material is not of similar type and hetrogeniously deposited. Under these conditions, the landfill material density, porosity, moisture saturation, radon emanation and diffusion coefficient could be different for each material, as well as spacially variable. A non-uniform distribution of radon in soil gas would result, independent of any potential groundwater transport of radon or U -238 and Ra - 226 leached from the landfill material. It should be noted that the release of uranium and radium into the groundwater, based on soil gas radon measurements, was omitted in the summary presented in the project's work plan.

- Since the soil gas radon concentrations are dependant on the material's radon emanation fraction and its ability to support large-scale diffusion (moisture saturation, porosity, etc.), it also should be recognized that it is possible to have elevated Ra -226 concentrations in the landfill that would not be readily detected by radon measurements. For example, the emanation fraction for artificially produced precipitates such a *sBa/RaSO is only a fraction of one percent.

- Therefore, additional measurements of soil gas radon to characterize the site relative to radionuclides would not be useful.

- oTo determine the radionuclide concentrations in the deposited material and its release into the groundwater, site soil and water samples should be collected and analyzed by test pits or borehole samplings. The potential of off-site migration of contaminated groundwater also should be investigated through sampling. A minimal radiochemical analysis should include: U -238, Th -230, Ra -226, Th -232, Ra -228 and possibly Ra -224.

CONCLUSIONS AND RECOMMENDATIONS

Based on the limited soil gas radon concentrations measured to date, drilling or constructing test pits into the landfill material is unlikely to pose a significant health risk to field personnel or the off-site environment due to the venting of radon gas. However, as noted above, the variety and hetrogenious deposition of material must be taken into consideration, particularly the possible presence of tailings and process wastes from manufacturing activities invol ng zinc an barium ores which could have associated radionuclide enrichment. In a ition, in the view of know Radium -228, in SM-4 ground water, it can be expected at some thorium -232 is exposed to leaching by ground water. Consequently, appropriate radiological air monitoring and personnel radiation protection practices should be applied during the sampling program.

APPENDIX J - ANALYTICAL DATA

A review was made of the Analytical Data of the Phase I Remedial Investigation. The intent of this review was to provide a general summary of the contaminants identified during the 1987 samplings observations

A. Groundwater (Monitoring Wells)

1. North Disposal Site

CONTAMINANT METALS	WELL #
Cadmium	**MW-1A, MW-1C, MW-2B, MW-2C, MW-3A, SM-5, DM-6, DM-8**
Chromium	**MW-1A, MW-3A, MW-3B, SM-5**
Lead	**MW-1A, MW-2A, SM-1**
Barium	**SM-1, SM-3**

ORGANICS	
Tetrachloroethylene (PCE)	MW-1A, MW-1B, MW-2A, MW-2B, MW-2C, MW-3A, SM-2, SM-3, SM-5, DM-8
Trichloroethylene (TCE)	MW-3A, SM-2, SM-3, SM-5 DM-8
1,2-trans-dichloroethylene (ACE)	SM-2, SM-3, SM-5

2. South Disposal Site

CONTAMINANT METALS	WELL #
Cadmium	MW-5A, MW-6B, MW-6C, MW-8, MW-9, MW-14, MW-15, SM-4 DM-4, DML-7, DMU-7, MW-11
Barium	MW-4A, MW-7A, MW-9, MW-14 MW-15, MW-13
Chromium	MW-8, MW-15, SM-4, DM-4
Lead	MW-7A, MW-9, MW-14, MW-15 SM-4, DML-7, DMU-7
ORGANICS	
Tetrachloroethylene (PCE) DM-4,	MW-4B, MW-8, DMU-7
Trichloroethylene (TCE)	MW-4B, MW-8, DM-4
1,2-trans-dichloroethylene DMW-7	MW-8, MW-9,

B. Christina River Water

Contaminants: - Cadmium and Copper

C. Christina River Sediments

Contaminants:
1) Metals: - Arsenic, Barium, Cadmium and Chromium

2) Organics: - Acetone, Carbon Disulfide and Methyl ethy Ketone

D. Soil Test Borings

CONTAMINANT	BORING #
METALS	
Barium	TB-1, TB-2, TB-3, TB-4, TB-5, TB-6, TB-7
Chromium	TB-1, TB-2, TB-3, TB-4, TB-5, TB-6, TB-7
Lead	TB-1, TB-2, TB-3, TB-4, TB-5, TB-6, TB-7
Mercury	TB-4
Silver	TB-4
ORGANICS	
Tetrachloroethylene (PCE)	TB-1, TB-2,
Trichloroethylene (TCE)	TB-1, TB-2
1,2-trans-dichloroethylene	TB-1, TB-2
Acetone	TB-1, TB-2, TB-3, TB-4 TB-6, TB-7
Methyl ethyl Ketone	TB-1, TB-4
Vinyl Chloride	TB-2
1-2, Dichloroethane	TB-4
bis(2-Ethylhexyl)Phrhalate	TB-4

D. SOUTH DISPOSAL AREA

CONTAMINANT	TRENCH #
1) METALS	
Arsenic	TP-1 THRU TP-8
Barium	TP-1 THRU TP-8

Cadmium	TP-1 THRU TP-8
Chromium	TP-1 THRU TP-8
Lead	TP-1 THRU TP-8
ORGANICS	
Benzene	TP-5, TP-7
Reactive Sulfide	TP-1, TP-3, TP-4, TP-6 TP-8

CONCLUSIONS

North Disposal Site

Toxic metalS and PCE groundwater contamination has been found in upgradient wells MW-1A, MW-2A, MW-2B, MW-2C, SM-5 and DM-8 and in downgradient wells MW-3A, MW-3B, SM-1, SM-5, and DM-6.

South Disposal Site

Toxic metals groundwater contamination has been identified in all of the shallow Unit I monitor wells, MW-6B, DMW-7 and DM-4, screened in Unit III A, and DML-7, screened in Unit IV.

However, (PCE) tetrachloroethylene contamination has been found in only wells MW-4B, MW-8, DM-4 and DMU-7. Each of these wells is screened in the Unit III A zone.

Christina River

Toxic metal contamination has been found in the water and sediment, and some organics were also identified in the sediment.

RECOMMENDATIONS

The toxic metals found in both of the Disposal Sites will have to be immobilized to prevent downgradient movement.

The PCE, TCE, DCE and other related compounds will need to be controlled at the source of contamination.

The organics compounds already in the groundwater should be monitored until they biotransformate into non-hazardous compounds.

2.0 Quality Assurance Project Plan

Section 3, page 3,para. 4

Typo in 1st abbreviation of Food & Drug Administration should be FDA, not DFA

page 4, para. 1

Sentence beginning "The quinacridone process..." should have a comma before the "and".

In same sentence, reference is made to "Dowtherm constituents". No previous reference explains what Dowtherm is or how it got to site.

In last sentence of paragraph, comma before "and" is unnecessary.

page 4, para. 3

This section contains a reference in the second sentence to silicon, which the context implies is a metal. Silicon is not a metallic element.

page 4, para. 5

If this sentence refers to all metals disposed on site, assertion is a non sequitor. Also, if disposed ThO_2 will not leach, where did Radium -228 and gross alpha concentrations found in Well SM 4 come from?

General Comment-Section 3.2: Note CrO_2 wastes were drummed or bagged. Is further information concerning exact mode of disposal of other wastes available? e.g. "red" and "black" muds apparently were dumped and allowed to dry - impoundments? Also, if disposed THO_2 will not leach, where did Radium -228 and gross alpha concentrations found in Wells SM 4 come from?

Section 3, page 7, para. 2b

surficial, not surfical

o Decay of thorium to radium -228and daughters proceeds through alpha and beta decays. Principal efforts in monitoring radioactive contamination in ground water should be so directed.

Page 8, 2c - "occurring", not "occuring" in 2nd point.

Section 3, page 10, Table 3-1

First two items are "garbage - several tons" and "trash - 100 tons". How are garbage and trash differentiated?

Two items of concern:

References to "bad quality" would be better termed "off grade" or other terminology.

At "Afflair fines" should read TiO_2

Page 11, Table 3-1 - "Laboratory, "not" Labortaory"

Page Section 3, page 13, Table 3-3

Dibromochloromethane, not diboromochloromethane.

Section 4, page 1, para. 2

"interaction with DuPont and U.S.EPA, Region III"

Page 3

ETC Laboratory Director, not Laboraory

Page 4, last para.

"response to" changes to "respond to"

Page 6

"Earth Technology Corporation's geotechnical laboratory", not "Earth Technology Corporation, geotechnical laboratory".

Section 5, page 2, 5.2, para. 2

Duplicates and spikes are to be run with frequency given in Table 5-1 differs from that indicated in Table 3-2. Accuracy and precision criteria are detailed in Tables 5-2, 5-3, 5-7, 5-8, and 5-9. These tables are duplicative, but not consistent. e.g., the control limit for the laboratory blank for extractable organic compounds from Table 5-7, the method blank for acid/base/material extractable organic compounds is 2DL. Table 5-3 indicates different sorragate spikes with slightly different control limits for volatile analysis.

Section 5, page 2, 5.2, para. 3

Detection limits for analytical testing are referred to as being given in Tables 5-5, 5-6, 5-10,and 5-11, but these tables are inconsistent, e.g.

	Table 5-6	Table 5-11
Aluminum	200	80
Chromium	10	8
Cobalt	50	6
Autimony	60	2
Barium	200	5
	etc.	

Table 5-6 gives Contract Required Detection Limits, Table 5-11 gives Method Detection Limit. Which will be achieved? If CDRLs, why have these levels which tend to be substantially above the method detection limit been selected?

Likewise, there are differences in the detection limits in Tables 5-5 and 5-10.

	Table 5-6	Table 5-10
Acetone	10	75
Benzene	5	1.5
Toluene	5	1.5
	etc.	

In this case, there is no reference to contract related limits.

These tables should be compressed into a more limited set of tables yielding an unequivocal set of limits.

Section 5, page 3, 5.3, para. 1

Remove - from accept-ance

General Comment - Section 5.3

This section asserts that the sampling program has been developed to provide data representative of site conditions. Sampling protocol on Table 3-2 addresses only river water and background levels. Is the purpose of this RI to determine site conditions or simply to attempt to justify no action by finding that no groundwater contamination migration is occurring? It has been established that Unit III A has organic contaminants and the Unit III A groundwater movement is to the east/southeast.

Section 5, page 3, 5.3, para. 2

Last two sentences state procedures used are expected to develop comparable data, but that data may not be comparable due to new procedures. This is contradictory. Also, these two sentences imply no change in the site conditions, which is an invalid presumption at this stage

Section 6, page 5, para. 2

A gamma-ray spectrometer is to be used to look for thorium? Gamma radiation from thorium -232 will penetrate on a few centimeters of groundcover. Thorium would have to be very near to the surface for detection; however, uranium 238 has several feet of penetration. Thorium decays to radium -226 and daughters proceeds with release of α and β particles.

This paragraph indicates that the instruction manual for the spectrometer "should be read by the operator prior to performing the survey". Does this indicate the level of experience of the operator?

Section 6, page 5, para. 3

This paragraph cites recommendations by the manual and supplier of the instrument that certain actions should be taken. It does not explicitly state that these suggestions will be implemented. Explicit instructions should be given on implementation.

Section 6, page 9, para. 1

"The depth intervals selected will be so selected..." On the previous page, depth intervals for the sediment samples have been given; if these are to be used, the sentence should read "The depth intervals were selected...". Are the described intervals to be used, or is a selection to be made later based on analytical sample requirements?

Table 1, which provides format for recording sampling depths, recoveries, section logs, location and lab identifiers is not in section 6. Where is it?

Section 6, page 10, para. 1

In line 2, "analysis" should be "analyses".

Section 6, page 12, 5.0c

Does this modification now read "After two minutes proceed to step d"?

Section 6, page 13, 8.0

Why is the factor $(1\text{-}e^{-\lambda t_1})$ deleted from these equations? This is obviously related to the dropping of step 5.0c. If Rn-222 activity is not being corrected for these steps, what is being measured? A "total radon"?

Section 7, page 1, para. 4

The sample decontamination scheme implies samples will not be labelled until they are removed from the contamination zone. Any measures to prevent confusion of samples, should be specifically stated i.e., number lids.

Section 7, page 2, para. 3

Remove the - from "labora-tory" in 2nd line after Sample Custodian's duty points.

Section 7, page 2, para 3

The Laboratory is committed to retention of soil samples for 30 days after analytical report. A QA/QC review of data received is to be conducted within this time period to allow re-analysis if necessary?

Section 7, page 3, 7.2, para. 3

On 2nd line, "and/or" instead of "andor".

The signature of the person working the entry should go at the end of the entry . While names of visitors and purpose of visit should go into a site log, the contractor may wish to have a separate site entry/exit log for visitors to sign.

Page 3,7.2, para. 4

Incorrect entries should be crossed out with one line and initialled.

Section 8, page 2, para. 1

"v,'ill" to be replaced with "will"

Section 9, page 2, Table 9-1

Volatile and extractable organics from biota and soil samples to be done by what method? What about metals and mercury in biota?

Section 10, page 1, para. 1, point 3

"computerized report" replaces "computerizedreport

Point 4

This is unclear; " a thorough audit of reports at a frequency of one in ten, and an audit of every report for consistency". Does this mean every report is reviewed for consistency, but only one in ten is thoroughly reviewed?

Section 10, page 2, para. 2, 1

Remove the "-" from "Com-ments".

Section 12, page 1, para. 1

Eliminate the - in "super-vising" in line 2.

3.0 Health and Safety Plan

Page 1, 2.0, para. 2

In line 3, wastes were disposed from 1902 to 1974.

Page 2, para. 1

In line 1 have reference to Figure 2-1. Where is this figure?

Page 2, para. 4

This paragraph argues that EPA's proposal of the site to the NPL based on HRS ranking is inappropriate and that EPA has ignored other migrating data. The HRS score is, according to the National Contingency Plan, the basis for proposal of a site to the NPL and is designed to give an estimate of actual risk, both present and potential, posed by a site. If the RP wishes to argue EPA policy or that existing data mitigate the risks posed by the site, they certainly have the right to do so. But the health and safety plan is not an appropriate forum for these polemics.

Page 4, 3.2, para. 2

In paragraph 1, Mr. James Buczala was designated SSO. In this paragraph, it is stated that the SSO must have completed a basic H&S training course and CPR/First Aid training and that the SSO having a science degree with additional training in instrumentation, toxicology, IH, etc. would be desirable. Is Mr. Buczala presented as having these qualifications? How many years experience does Mr. Buczala have? His resume' is not part of the Work Plan or the Health and Safety Plan.

Page 6, 3.3

Who is the HSO that is responsible for the site?

Page 7, 3.4

Who is the CHSO?

Page 8, 4.0, para. 2

Table 4-1 is referred to but not to be found in the HASP. A reproduction of Table 3-1 from the QAPP would be an appropriate addition to the HASP at this point. (The HASP, being a document site personnel must read and understand, must be a stand-alone document.)

Page 9, 4.0, para. 1

Asserts no RCRA-listed waste was known to have been disposed at north site. Depending on EP tox, barium and cadmium ore residues could be D005 and D006 wastes, chromium D007; tetrachloroethylene would be in F002 solvent. This statement that no RCRA-regulated wastes were disposed is questionable.

Page 11, para. 4 & 5

Reader should not have to go outside HASP for information (stand-alone). Presence of asbestos, PCBs, and/or PBBs is not referenced.

Page 12, para. 1

Actual groundwater monitoring data is referenced in Section 5 - of what? Not the HASP. Not the QAPP.

Page 12, 5.0, para. 1

10.2 or 11.7 cV HNU lamp? Which? Either? Both?

What is IP of tetrachloroethylene?

Page 13, para. 1

Upper limit for level B work? Level B is not the highest level of protection available - would work be stopped or go to Level A? PPE required described in Section 8.

page 21, 7.1.1

Disposal of water used in deconing equipment - How?

Page 22, 7.1.2, para. 3

"The personnel decontamination line...", not "lime".

Page 23, 8

Level B apparatus is not described.

NOTE: If personnel work is Level D with leather boots, no boot covers, will boots be subjected to wash and rinse as specified in decom line setup in Section 7.1.2, page 22?

Page 26, 9.0, para. 1

On fifth line, "Signed...", not "Singed Compliance Agreement..."

Page 28, 9.2

In addition to SSO checking that all team members are accounted for, should include "buddy system" and/or setup watch to ensure team accounted for.

Page 34, 11.2.3.1, para. 2

"Precipitation" not "Precipitations"

Appendix A, page 3, 1)

On last line, "when the wool is wet", not "whenthe..."

Appendix A, page 4, 6)

Where is Table A-4?

APPENDIX - Project Safety Documentation

GENERAL COMMENT: Most of the necessary elements of the safety plan are here, but the order of presentation could be improved to make the plan more understandable. Items such as air monitoring while in Level C seem to be almost footnotes in the current format.

Two substances on site perhaps merit special attention:

1. Asbestos - the asbestos is buried and given the high water table likely to be wet if encountered. The drilling methods selected should not generate asbestos dust. But, if asbestos -contaminated areas can be identified, it might be advisable to either avoid them or take extra precaution in working there.

2. Nickel wastes - Nickel is a sensitizing agent which involves the immune system in its toxicity. Thus, TLVs and such are not applicable in dealing with Ni. Hazline recommends Level B for <u>any</u> measurable quantity of Ni in the air. Depending on the nature of the Ni waste disposed and the mode of their disposal, an assessment of the possibility of raising a Ni-containing dust in these operations should be made. If such a dust will be generated, options need to be developed to keep the dust down, avoid the involved area, or raise the PRE level.

IV CONCLUSIONS AND RECOMMENDATIONS

The review of this work plan provides the following conclusions:

1. That the contaminants in the North and South Disposal Site present a hazard to human health and the environment.

2. That the water in monitor well SM-4 is contaminated with Radium -228 and gross alpha concentrations.

3. That a PCE contamination pathway exists from the surface upgradient of the North Disposal Site down to acquifer (Unit III A) then downgradient under the Christina River and finally appear in (Unit III A) wells inside and southwest of the South Disposal Site.

4. That toxic metal contamination is present in the North and South Disposal Sites and that migration pathways lead to the Christina River and downgradient South and east of the South Disposal pit.

5. That the monitor wells MW-1A, MW-1B, MW-1C, MW-2A, MW-2B, and MW-2C have been contaminated with toxic metal and PCE's and that acquifers Units I, III A, and IV have been infiltrated by these contaminants.

6. That surface flow from both disposal sites drain into the Christina River.

7. That the predominant downgradient flow is to the southeast.

The following action is recommended:

1. That action be taken to eliminate the human health and environment hazards presented by the North and South Disposal pits.

2. That monitor well SM-4 be resampled for Radium -228 and if it is still present, action be taken to locate the buried thorium -232 source and eliminate it.

3. That additional monitor wells be installed at 200 foot intervals along both sides of the Christina River and along the south and east side of the South Disposal Site. Offsite downgradient wells be installed at a distance that will identify the leading edge of the migrating contaminants.

4. That additional tests be taken to determine the source and possible migration path of contaminant from upgradient monitor wells MW-1A, MW-1B, MW-1C, MW-2A, MW-2B, and MW-2C.

5. That additional groundwater samples be taken from Unit III A monitor wells south of the Christina River to establish if the PCE contamination is increasing.

6. That the additional samples addressed in the work plan be taken.

DU PONT NEWPORT SITE
REVIEW/COMMENTS
ON WORK PLAN

REFERENCES

1. NCP

2. Consent Order

3. U.S. EPA Guidance on Remedial Investigation Under CERCLA. (July 1988)

4. U.S. EPA Guidance on Feasibility Studies Under CERCLA. (July 1988).

5. Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act. 40 CFR Part 136, Oct. 1984.

6. National Oil and Hazardous Substances Pollution Contingency Plan. 40 CFR Part 300, Nov. 1985.

7. NEIC Policies and Procedures. EPA-330/9-78-001-R, Revised June 1985.

8. McCarty, P.L., "Anaerobic Biotransformations of Chlorinated Solvents," Presented at a Technical Seminar: Biological Approaches to Aquifer Restoration—Recent Advances and New Opportunities, Presented by Department of Civil Engineering, Stanford University, Stanford, California 94305, June 17, 1986.

9. Wilson, J.T., "Aquifer Microbiology and Aerobic Trans-formations of Chlorinated Solvents," Presented at A Technical Seminar: Biological Approaches to Aquifer Restoration—Recent Advances and New Opportunities, Presented by Department of Civil Engineering, Stanford University, Stanford, California 94305, June 17, 1986.

10. Parsons, F and Lage, G.B, "Chlorinated Organics in Simulated Groundwater Environments," Journal AWWA, May 1982, p.52.

11. Bouwer, E.J. and McCarty, P.L., "Transformations of 1- an 2-Carbon Halogenat Aliphatic Organic Compounds under Methanogenic Conditions", Applied and Environmental Microbiology, Apr., 1983, pp. 1286-1294.

ORIGINAL
Red

DRAFT

REVIEW/COMMENTS
ON
HYDROGEOLOGICAL REPORT
DU PONT NEWPORT SITE

1.0 INTRODUCTION

This report was prepared in accordance with EPA directions as received by Jacobs Engineering Group Inc. (Jacobs) in Work Assignment C03001, RI/FS Oversight.

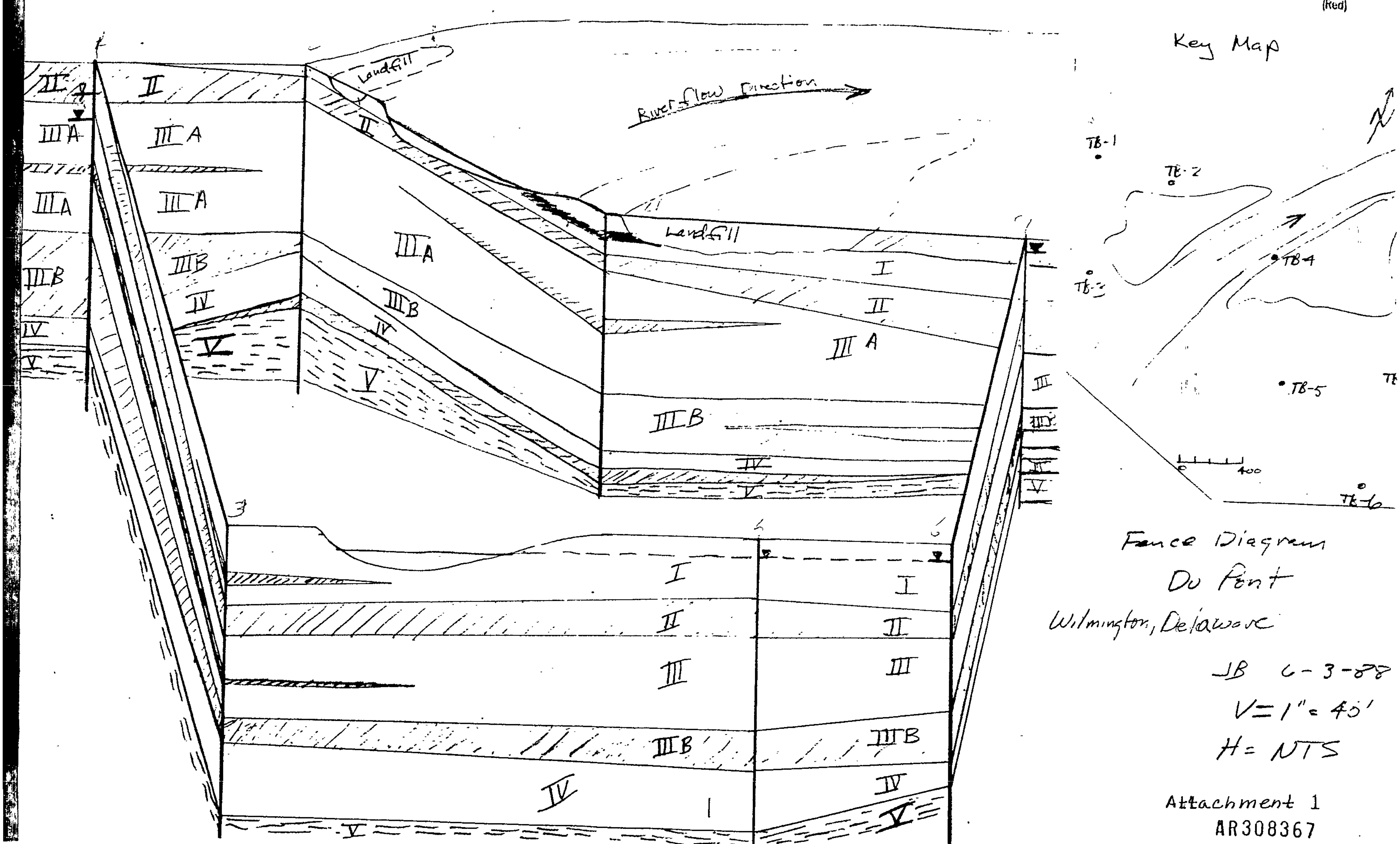
The purpose of this report was to present the results of Jacobs technical review of the Hydrogeological Report, Du Pont Newport Site, Newport, Delaware, prepared by Woodward Clyde consultants. Jacobs was to determine if the study was scientifically correct; specifically, that the number of wells sampled were located in the appropriate place, are of adequate depth and that sampling procedures, record keeping and documentation are in accordance with EPA guidelines. In addition, a review of comment will be made on Volume II of the Hydrogeological Report, Appendices A thru E. This review will be made as to the adequacy of the data and as appropriate on the correlation of data with the Hydrogeology Report.

2.0 SITE HISTORY

The Du Pont Newport Site consists of two separate area's separated by the Christina River. The northern portion is a seven acre parcel bounded on the south by the Christina River and on the north by the Du Pont Holly Run Plant and Ciba-Geigy Newport Plant. The southern portion is a fifteen acre parcel bounded by the Christina River on the northwest. These parcels are referred to as the North Disposal Site and the South Disposal Site respectively.

The Newport Plant is a pigment manufacturing plant located at James and Water Street in Newport, Delaware. The plant was originally owned and operated (from 1902 to 1929) by Henrik J. Krebs for the manufacture of Lithopone, a white inorganic pigment. In 1929, Du Pont purchased the plant and continued to manufacture Lithopone along with other materials, including organic and inorganic pigments The pigment manufacturing operations were purchased by Ciba-Geigy in 1984. Du Pont has retained the chromium dioxide magnetic recording tape operations at their Holly Run Plant.

The Du Pont Newport site, originally, was tidal wetlands before it was used as a burning dump and industrial landfill. During past plant operations, areas of the Site bordering the Christina River were landfilled as a means of waste disposal. Landfilling occurred in both the North Disposal site and the South Disposal site. The North Disposal site was used for disposal of general refuse and process wastes from 1902 until 1974. The North Disposal site received a variety of material, including plant debris such as off-spec product Corian (imitation marble) counters, empty steel drums, metal alloys, liquid wastes, and pigment muds. After disposal ceased in 1974, the North Site was capped with approximately two feet of clay.



Fence Diagram
Du Pont
Wilmington, Delaware

JB 6-3-88
V = 1" = 40'
H = NTS

Attachment 1
AR308367

The South Disposal site was operated from approximately 1902 to 1953. Materials deposited in this landfill consisted of primarily insoluble residues of zinc and barites ores, which were pumped as a slurry through a pipeline under the Christina River. Some dikes and berms were constructed to contain the material. In 1973, the State of Delaware, Department of Highways, deposited approximately 130,000 cubic yards of additional soil from highway construction at this location, covering the South Disposal site with an average three feet of variable soil.

During the period 1975 to 1981, ground water quality investigations were conducted by Du Pont under the approval of the State of Delaware, Division of Natural Resources and Environmental Control (DNREC). Over this time, additional test wells and monitor wells were installed to evaluate the geologic and hydrogeologic conditions in the vicinity of the Newport Site. Some of these monitor wells are still utilized to monitor groundwater quality and water levels. The North Disposal site was the subject of a Hazardous Ranking System (HRS) evaluation made by the EPA in 1986. Consequently, Du Pont directed Woodward Clyde Consultants to conduct a full scale site investigation at the Newport Plant Site beginning in June, 1987 to characterize the site hydrogeology in great detail. The site investigation was addressed in the proposed RI/FS Work Plan submitted by Du Pont to the EPA in July, 1987. This site investigation was designated as Phase I of the RI assessment and was designed to collect data to determine the need for a complete RI/FS. The South Disposal Site was included in the assessment because of certain waste products were also disposed at the site.

The current Hydrogeological Report was prepared by Woodward Clyde Consultants from available pre-existing data and data compiled during the Phase I investigation.

3.0. GENERAL COMMENTS

Volumes I and II of the Hydrogeological Report were reviewed to assess whether Woodward Clyde Consultant (WCC) adequately characterized the site hydrology. Also, that the monitoring wells were adequately placed to detect and characterize the release of hazardous waste or constituents.

According to WCC, the purpose of the Hydrogeology Report is to review relevant data in order to estimate ground flow direction at the Du Pont Newport Site. The data reviewed in this report included the regional setting, existing boring and well installation, site stratigraphy, downhole geophysics, aquifer test and groundwater head measurements. Therefore, the hydrogeological report was technically reviewed to insure that WCC accomplished the purposes of the report and to assess the adequacy of the site hydrology characterization and well placement. Specific comments were written on these subjects and recommendations were suggested, as appropriate, to support WCC objective to define site hydrology and well placement in characterizing a release.

4.0 . SPECIFIC COMMENTS VOLUME I

Section 2.2.2

Woodward-Clyde Consultants (WCC) describes the water bearing units as Unit I, Unit III A and Unit IV. The aquitards, silty clay beds were designated as Unit II and Unit III A. These units cause the waters bearing units (Unit III A and Unit IV) to react from semi-confine to confine conditions. Unit III A is separated from Unit I by a clay bed which exceeds 15 feet thickness throughout the site. WCC neglected this clay layer between Units I and III A in calculating discharge to the river.

Section 3.1

Cross Section A-A was drawn in the approximate dip direction. What is the dip & direction?

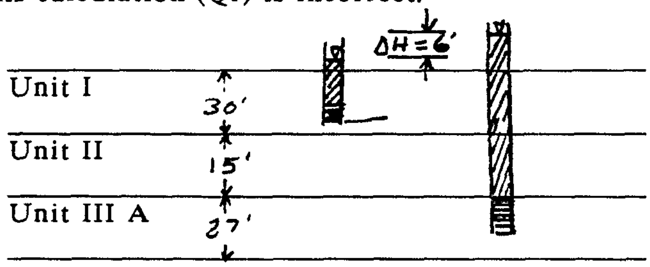
Section 3.2

WCC was tasked by Du Pont Newport to estimate the flow of groundwater for each water bearing unit at the site. Therefore, the groundwater flow velocity (discharge) for Unit I, Unit III A and Unit IV was established by WCC by applying Darcy's equation (page 11, Volume I). Also, the groundwater flow velocity acts in these units in the vertical direction (under semi-confine or confine pressures) and in the horizontal direction (along the gradient). WCC calculated the loss of water from Unit III A upward to the Christina River which is located between disposal sites (refer to page 11 and 12, Volume I). The water lost from Unit III A is the vertical component of the groundwater flow velocity from this water bearing unit. However, WCC's calculation for discharge appears to be incorrect since the hydraulic conductivity and thickness of Unit II was disregarded. The water logs from Unit III A to Unit I 'plus' the water loss from Unit IA to the Christina River equals the water lost from Unit III A to the Christina River if Unit IV is under totally confine conditions.

In order for WCC to calculate the discharge (vertical velocity for groundwater), it is recommended that both field and laboratory permeabilities are established for Unit II and Unit IV. WCC should present the range of permeabilities (i.e., Unit II, $P=10^{-1}$ to $4x10^{-3}$ gal/day/ft^{-3}) and a range of thickness for Unit II and Unit IV.

The water lost from these units may be calculated from Darcy's equation. The water from one foot width of Unit III A from SM-3 to DM-5 at low tide (refer to p. 12 and Figure 11, Volume I) is equal to the hydraulic conductivity multiplied by the change in head from monitoring wells SM-3 to DM-5 divided by the thickness of Unit II, and multiplied by the unit area of Unit III B. WCC should calculate the vertical flow velocity from both Unit III B and Unit IV.

DM-5 is not located on any map including Figure 11. The calculation for Qr was based on the discharge for one foot width of Unit III A from well SM-3 to DM-5. However, SM-3 is not a Unit III A well; Table 2 lists SM-3 as a Unit I well. WCC ignored the Unit II bed between Unit I and Unit III A such that this calculation (Qr) is incorrect.



15' Clay in Unit II

<u>Assume</u>: Clay (p.)permeability: p.=(10^{-1}- 10^{-3})

Qr-Discharge from Unit III A to Unit I

$$Qr = {}^{p.}/m \; \Delta H A$$

$$Ql(max) = \frac{10^{-1} \frac{gal/day}{ft2} (6\ ft)\ [27' \times 1\ ft^2]}{15\ ft}$$

$$= 1.08\ gal/day$$

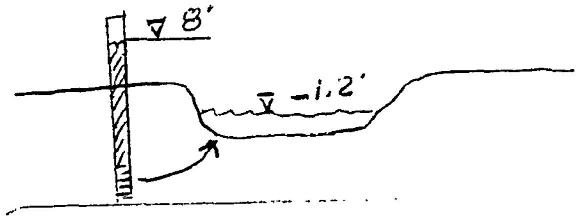
$$Ql(min) = \frac{10^{-3} \frac{gal/day}{ft2} (6ft)[27]\ [1\ ft^2]}{15\ ft}$$

$$= 0.01\ gal/day$$

so, therefore the discharge to Unit I ranges from

<u>1 gal/day to 0.01 gals/day</u>

To calculate the discharge into the river at low tide (refer to Figure B) SM-3.



$$\text{discharge to river} = \frac{3000^{*}(9.2)}{32\ (200)} [1 \times 32] + QR \quad \Delta H = +9.2'(\text{*page12})$$

$$= 138 + 1 \sim 140 \text{ gal/day}$$

The magnitudes for the horizontal groundwater flow velocity (horizontal discharge for Unit III A was discussed by WCC (refer to page 13, Volume I)). However, no direction was given to these *velocities.

Figure 6

The shallow zone is depicted incorrectly. See Appendix B for correction and rationale.

Figure 7

This Figure shows that during low tide, the groundwater flow from Unit I at the Du Pont North Landfill is directed southeast into the Christina River and that the groundwater flow from the South Disposal Site appears to have a "domal" effect at the landfill. In addition, steep gradients direct groundwater to the river and groundwater also flows away from the South Disposal Site in two other directions. This is ~~not~~ fully supported by data in this report. Neither is the potentiometric contour surface 4 around the South Disposal Site and surfaces northeast of MW-4 cluster and MW-15 supported by any information in this report.

Figure 8

This Figure is similar to Figure 7 and appears to have the same groundwater flow interpretations. However, the Christina River appears to recharge Unit I north of the South Disposal Site during high tide. The shallow zone potentiometric surface elevations are presented near the South Disposal Site in the northeast with two (2)-three (3) foot elevation next to each other. WCC should explain if this is an error.

Figures 9 & 11

These figures show that during low tide the groundwater gradients flatten out in both Unit III A and Unit IV. However, groundwater direction does not appear to change and, during high tide, the gradients cross both sites steepen.

Figures 13, 14, 15

Figures 13, 14, and 15 disregard the presence of a clay layer with a minimum thickness of 15 feet in Unit II. Figure 13-15 should directly correlate to Figure 7-12; however, the contours of head (msl) appear to misrepresent well location vs. head (Figure 14 - MW-7A, 7B, 7C).

Figure 14

Note: Please explain groundwater flow potential at low tide near the south landfill area. There appears to be a data gap in the deeper zones near Monitoring Wells 14 and 15 to support the associated discharge drawing into the Christina River.

VOLUME II

Data compilation of boring logs and geophysical logs is adequate for the purposes of defining hydrogeologic conditions present beneath this site. However, the conclusions and interpretation of these data seem to be somewhat in error. Therefore, an effort should be made to insure that all geologic processes past and present be considered, and that all lithostratigraphic information be portrayed in the most accurate way. This would include placing physical descriptions of soils encountered with depth beside the geophysical log so that correlation between locations is possible. Also, all information concerning soils tests, and contamination encountered should be presented on geologic cross sections. Additional information that could be provided on these diagrams should include hydrostatic water levels in relation to landfill and river cross sections. No discussion was made of any data gaps that need to be resolved by the field investigation. Data gaps are known to exist and should be discussed with regard to offsite migration.

APPENDIX A

General Comments: The data presented in this section is incomplete and does not show enough information to accurately portray the site geology in the downgradient direction. Many boring logs are missing and no explanation is given on where these boring logs can be obtained. Several errors can be noted on interpretation of data which could have a serious impact on conclusions. No discussion concerning data gaps is offered, nor is there any strategy for resolving any data gaps that might remain.

The following detailed comments are made on a page by page basis of the Test Boring, Soil Sampling and Monitor Well Installations at the Du Pont Newport Site.

- Executive Summary: This summary describes the various procedures and methods used for drilling and installing monitor wells in adequate detail. However, there is no discussion on the geological units encountered and the general characteristics of the sediments that the wells are placed in. There should be a description of what units are being monitored and why. There should also be a discussion on what monitoring is not being done and what strategy will be proposed to define the extent of contaminates that are presently migrating downgradient. What was the reasoning for using well screens out of two different materials?

Introduction: A major portion of this section is stated word for word from the Executive Summary. This is unnecessary and repetitious, as these procedures are previously discussed in adequate detail two pages prior to this section.

Boring Logs - General Comments: Boring logs should be more complete,and several logs are missing. More information should be presented on these boring logs which pertains to the Unified Soils Classification System whenever possible. Were any soils analyses run on selected samples for permeabilities, sieve analysis and atterberg limits? These data should have been collected and presented on these logs. Also, why is water level data present on some logs and absent from others? These data should be presented in a more consistent manner and an effort should be made to interpret these logs better There is no correlation of the designated Units I, II, III A, III B, IV and V to the lithology presented on the boring logs. Why?

Clay units should be better defined in the boring logs since these are more effective hydraulic barriers. A more detailed interpretation of this information would provide a better understanding of possible waste migration routes.

A black silty, sampy material was noted in the log on TB-4. Was this material chemically analyzed? What preventative measures were used not to induce this material down the boring into other water bearing units?

Why were no boring logs prepared for Monitor Well numbers 8, 9, 10, 11, 13 14, 15? It would also be useful to see descriptions of the fill material and to know what the vertical extent of the landfill is near MW-15.

APPENDIX B

The two cross sections Figures 5 & 6 should be drawn as a fence diagram to scale showing the relative elevation for the river and landfills. This would allow projection of stratigraphic columns to scale in these relative locations. (see attachment I).

Table 3

Pre-Existing Active Monitoring Wells as found in Volume 1 of the Hydrogeological Report for Du Pont Newport Site dated 9/87, is a list of existing monitoring wells. The list shows that wells were drilled to a total depth but screened at a distance much less than the total depth. Was the hole plugged up to the placement of the well screen? To understand the groundwater monitoring system, Du Pont Newport should provide the descriptions of the boring logs and monitoring well details.

APPENDIX C

Boring Geophysical Logging at Du Pont, Newport - General Comments: The borehole geophysical boring data is presented in an adequate manner for the purposes of this report. However, the interpretations and conclusions drawn by this report are basically wrong. The basic reasons for the wrong interpretations are presented in the detail below.

The interpretation of units encountered for the log of TB-1 is questionable. Close analysis of detailed boring information, compared to geophysical signatures of logs from other borings indicate that Unit I is not present at TB-1 as presented in this section. This can be seen by close comparison o logs from TB-1 to TB-4 log. Natural Gamma responses are almost identical and correlate well. This makes sense given the sedimentary processes that are actively occurring in this alluvial valley system. Unit II is close to the surface at TB-1 and dips gently underneath the river and both landfills. (See attachment 2).

APPENDIX D & E

The aquifer tests as conducted are adequate for the purposes of this report. Graph for MW-7A and MW-6B is missing and MW-7C is a duplication.In addition, neither pump test had a well being monitored across the river. WCC should explain the reason or was this an oversight?

5.0 CONCLUSIONS AND RECOMMENDATIONS

WCC did provide both low-tide and high-tide potentiometric surface maps for Units I, III a and IV. Groundwater flow direction can be interpreted from the maps located in Figures 7 through 11. WCC should provide more discussion on groundwater flow and the differing gradients due to tidal effect (Figure 7-11). It is recommended that the horizontal groundwater flow velocity be expressed in both magnitude and direction for water bearing Units I, III A, and IV.

In WCC's discussion on groundwater flow velocity and direction, Figure 2 indicated a slight dip direction to the southeast. It is recommended that the dip magnitude and direction for each geological unit is defined. The groundwater flow velocity should then be expressed perpendicular to the dip of the water bearing unit and in the same direction as the dip of the unit.

The hydrostratigraphic units, which WCC has interpreted from test borings, soil samples, borehole geophysical logic, aquifer tests and hydrography's of wells and the Christina River (as found in Volume II), were presented to support the conclusion that vertical groundwater flow north of and underneath the Christina River is upward from Unit III A into Unit I and into the Christina River. However, the five hydrostratigraphic units (Unit I - Unit V) were portrayed as continuous across the site which appears to be contrary with the test borings, geological report, and the borehole geophysical logs as included in Volume II. From these data, Unit I appears to be missing at test boring (TB-1) #1 and various silty/clay layers pinch in and out of Unit III A.

A fence diagram has been drawn to represent the interpretation of data from Volume II. It is recommended that WCC should draw a fence diagram based on the test borings and all other boring log information. WCC should correlate the hydrostratigraphic units from the borehole geophysical logs and test boring data. Additional borings may be needed to define the hydrostratigraphic units. The fence diagram must be drawn to scale and show the river and landfills to scale.

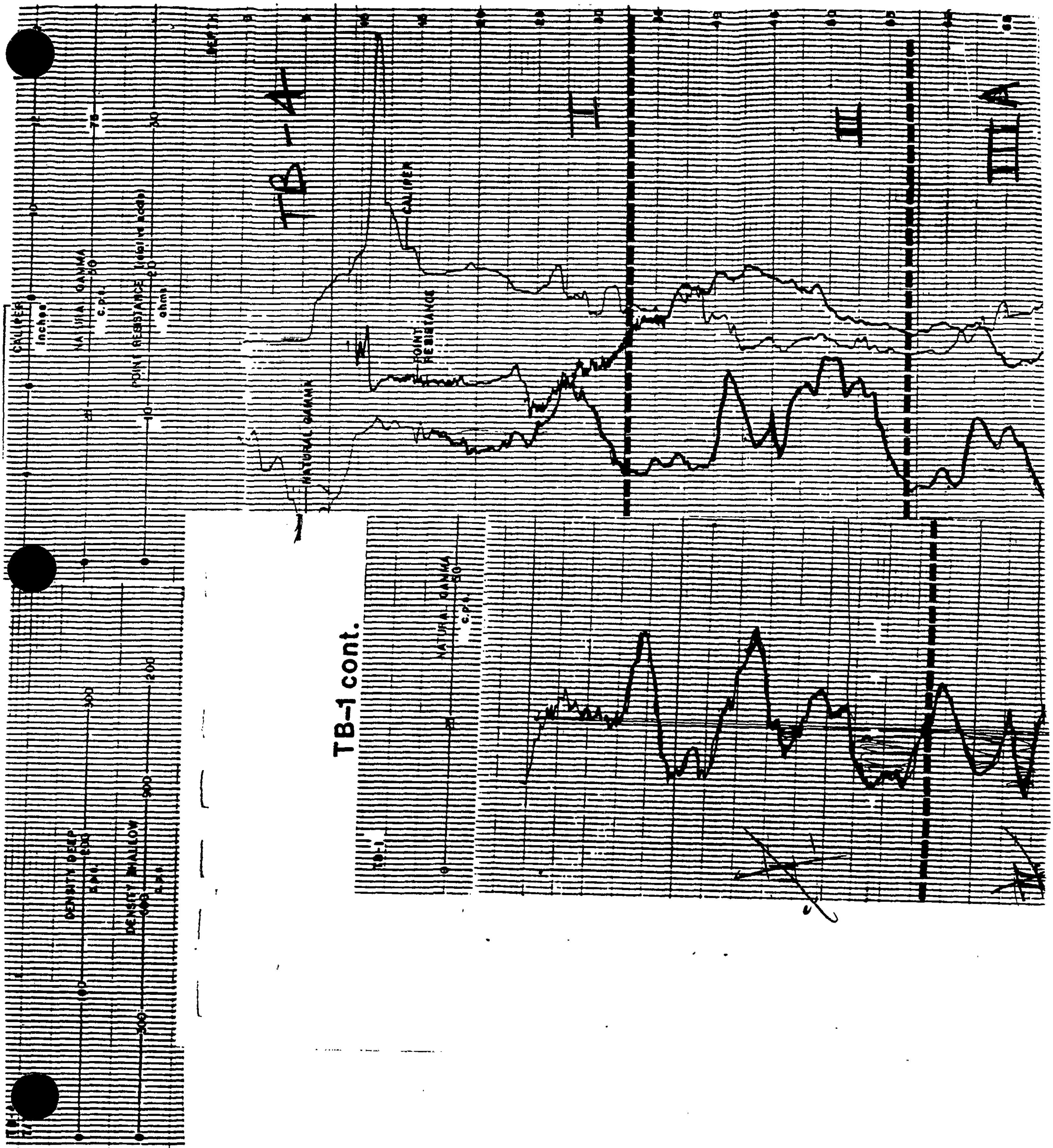
The water bearing units (Unit I, Unit III A and Unit IV) are currently being assessed in Du Ponts groundwater monitor program. The groundwater monitoring wells were placed both north and south of the Christina River near both landfills. WCC has shown that the groundwater elevations are transitional to the tidal effect noted in the Christina River. Therefore, the groundwater gradient depends on the tidal stage. WCC has shown (Figure 7 and Figure 8) that there are only two (2) downgradient monitoring wells (SM-4 and SM-1) located near the Newport Plant Landfill. It is recommended that at a minimum Du Pont should place two (2) additional shallow monitoring wells (Unit I). The location of one shallow well could be installed equal distance between SM-4 and SM-3. The other shallow well may be installed between the Newport Plant Landfill and the river at a distance of 100 to 150 feet northeast from well SM-3. Likewise, WCC has shown for Unit I at the south landfill that the groundwater downgradient extent is outward on all sides of the landfill. There appears to be three (3) downgradient monitoring wells near the south landfill. MW-4A is located northwest of the south landfill and is the only downgradient well placed in approximately 1400 foot groundwaters (Unit I) flow path. Both MW-14 and MW-15 were located downgradient of the south landfill on the eastern side of approximately 800 feet.

There appears to be (Figures 7 & 8) no near by downgradient wells south of the landfill which length is approximately 1100 feet. It is recommended that Du Pont installs additional shallow monitoring wells (Unit I) wells) completely surround the south landfill. The monitoring should not be spaced from each other at distances no greater than 100 feet. The monitoring well's screen length should be based on the properties of the contaminants which are to be detected. WCC should discuss this point.

The monitoring wells located in Unit III A downgradient from the Newport Plant Landfill and the south landfill appears not to exist (Figures 9 and 10). It is also true that no downgradient wells from both landfills have been placed in Unit IV. Du Pont should propose to EPA a groundwater detection system which monitors Unit III A and Unit IV near both landfill units. It is recommended that a minimum of four (4) monitoring wells in Unit III A and Unit IV be installed between the Newport Landfill and the Christina River. Du Pont should place monitoring wells near the south landfill on its south side and its eastern side in Units III A and IV. The interval between each well should be based on site conditions. Du Pont should explain in their proposal the rationale for choosing the horizontal well spacing and vertical screen location.

From the existing groundwater data available from Du Pont, the facility can not adequately detect or characterize a release from the Newport Plant Landfill or the South Disposal Site in Unit I, Unit III A, and Unit IV. Du Pont should consider the recommendations made in this section and propose a plan that EPA establish an adequate groundwater monitoring detection system for all water bearing units.

ORIGINAL
(Red)



Attachment I 2

AR308376

ORIGINAL
(Red)

DRAFT

REFERENCES

OSWER - 9950.1, RCRA Technical Enforcement Guidance Document.